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THE HISTORY AND CHEMICAL ANALYSIS OF THE MINERAL WATER LATELY DISCOVERED IN THE *CITY of GLOUCESTER;*

THE

VARIOUS DISEASES TO WHICH IT IS APPLICABLE CONSIDERED;

AND THE NECESSARY REGULATIONS FOR DRINKING IT WITH SUCCESS ASCERTAINED AND PRESCRIBED.

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M DCC LXXXIX.

[PRICE ONE SHILLING.]

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ERRATA.

Owing to the hurry in which theſe pages have been committed to the preſs, the following particular errors have been committed:—In page 38, line 9—The quantity of air remaining from the whole, which was not affected by lime-water, amounted to 20 ounces—inſtead of which, read 30; and in line 21, inſtead of 28, read 18 ounces. Theſe two inaccuracies muſt make an alteration in page 50, line the firſt, viz. inſtead of 28, read 72 ounces.

TO THE

INHABITANTS

OF THE

CITY of GLOUCESTER,

AND ITS VICINITY.

IN dedicating theſe pages to you, I ſhould be wanting in my duty, did I not offer ſome apology for the inelegant manner in which they appear; but when the difficulty of the undertaking is conſidered, together with the ſhort time allotted me, I may claim perhaps your indulgence; eſpecially ſhould it be found, that my inaccuracies are in language, rather than in the more eſſential part of my ſubject—the experiments and deductions.

That they have been ſtated with truth, and the concluſions drawn according to reaſon, is in the power of others to prove.

Permit me, then, to congratulate you in the poſſeſſion of ſo valuable a remedy as this water is likely to prove. And I make no doubt that its celebrity, joined with the attraction of your polite and elegant manners (which I take this opportunity with pleaſure to teſtify and acknowledge) will ſoon render THE CITY OF GLOUCESTER a place of faſhionable reſort.

I remain, with reſpect,

Your moſt obedient,

humble Servant,

June 27th, 1789.
No. 54, King-Street,
Argyle-Buildings.

JOHN HEMMING.

THE

HISTORY, &c.

CHAP. I.

PREVIOUS to my entering upon any part of this treatiſe, I think it will not be unacceptable to my readers if I make them in ſome meaſure acquainted with the city of Glouceſter and its environs, together with the advantages that ſtrangers may derive from the ſalubrity of its ſituation; to which I ſhall ſubjoin an account of the origin and hiſtory of the Mineral Water, which is to form the ſubject of the following pages.

Glouceſter is a city of great antiquity, and conſiderable opulence. Though a large town, it is remarkably healthy. It is a known fact, that infectious fevers ſcarce ever make their appearance amongſt its inhabitants; and if ever ſuch diſeaſes ariſe, that their progreſs is always confined to a very few ſubjects; which are in general ſuch of the poor as are prediſpoſed to fevers by want of cleanlineſs, and various irregularities.

The healthfulneſs of the town may be attributed to ſeveral local advantages. In the firſt place, its ſtreets are ſpacious, and interſect each other at right angles; and this circumſtance, added to that of the houſes not being built of too great a height, is exceedingly favourable to free ventilation. Nor are the currents of air obſtructed by gateways, projections, &c. all ſuch nuiſances having been lately removed by the authority of parliament; and at the ſame time the ſtreets were paved, and proviſion made for lighting them.

The center of the city ſtands on a more elevated ſite than either of the extremities; and there is a gradual deſcent from it in every direction, by which means filth of all kinds is readily waſhed away, and water is prevented from ſtagnation.

Another cauſe of this peculiar ſalubrity is the influence of the tide in the Severn, which runs cloſe by the town; and, in conſequence of the form which its banks aſſume, at a ſmall diſtance from Glouceſter, and nearer to the ſea, the tide comes up to the town in a ſingular manner, and with a boiſterous impetuoſity. When we conſider how much the agitation of water conduces to the purifying of the circumambient air, we may readily aſſent to the popular opinion, that Glouceſter is rendered healthy by the tide.

A third cauſe may be aſſigned in the reſpective ſituation of the neighbouring hills which ſurround the town at a moderate diſtance, forming, as it were, a ſpacious amphitheatre. The effects of theſe eminences on the neighbouring vales are well underſtood by naturaliſts. In Robin Hood's Hill, the property of Mr. Selwyn, are formed large reſervoirs of pure water, which is conveyed by aqueducts to the town, and ſupplies moſt of the houſes.

No city in England is leſs infeſted with vagrants and diſorderly perſons; a felicity, which is partly to be attributed to the good habits of the better claſs of citizens, which, of courſe, influence the manners of their inferiors; and partly to the excellent police of the magiſtrates, which diligently exerts itſelf in ſuppreſſing diſorders within the town, as well in vigilantly attending to all vagabonds, and ſtrangers of a ſuſpicious appearance.

The common manufacture of the town is pin-making. Much indeed to be commended, on account of the great numbers of poor of all ages and ſexes, which it ſupplies with labour and with bread. It were, however, greatly to be wiſhed that it were a more healthful occupation. In moſt of its branches it is very dirty, and requires a ſedentary life; therefore, if temperance and cleanlineſs be not ſtrictly adverted to, it muſt frequently injure the health of the manufacturer, as well by the effects of his confinement, as by his ſwallowing and inhaling the metalline particles.

In ſpeaking of Glouceſter, I cannot forbear mentioning, that here originated the popular inſtitution of Sunday-ſchools; the firſt of the kind being eſtabliſhed in one of its pariſhes, by the joint labour and expence of the reverend Mr. Stock, and Mr. Robert Raikes; the former a clergyman, whoſe abilities and manners do honour to his order; the latter diſtinguiſhed by his attention to the condition of the poor, and his indefatigable exertions to promote the progreſs of this inſtitution throughout the kingdom.

Adjoining to the city has lately been erected a ſpacious and well-built county goal, which is conſtructed ſo as to produce every effect of ſecure confinement, puniſhment, and reformation that can be found in a priſon; and probably the proviſions which have been made for keeping it clean and well ventilated, will for ever preſerve its miſerable inhabitants from generating and communicating the dreadful poiſon of the goal-diſtemper.

The fineſt feelings of humanity will be amply gratified by ſurveying the general infirmary in the ſuburbs of Glouceſter; an inſtitution, the ſupport and the management of which does the higheſt honour to thoſe by whoſe munificence it is maintained, and by whoſe care it is regulated. It frequently provides, at one time, for the relief of nearly one hundred and forty patients in the houſe, beſides a proportionable number of out-patients.

The ſame degree of neatneſs, cleanlineſs, and good order prevails in this hoſpital, which is to be deſired in the beſt conducted private family; nor is any relief with-held from the bed of ſickneſs, which expence, care or attention can adminiſter.

Unfortunately the annual expences of the charity always exceed its *certain* income; but it is to be hoped that the deficiencies will never fail of being made good by the *benefactions* of thoſe, who poſſeſs benevolence as well as riches. In juſtice to thoſe employed in the medical and chirurgical department, it ought to be mentioned, that the objects of this *public eſtabliſhment* are attended, and have their medicines diſpenſed, with all the punctuality and exactneſs of *private practice*.

The ſtranger, who reſides a ſhort time in Glouceſter, is ſuprized that more manufactures are not eſtabliſhed in a town, whoſe ſituation has been always well adapted to them; and has of late been more particularly ſo, by a ready communication with every part of the kingdom, and, of courſe, with all the world. The lately-effected junction of the Severn with the Thames, in this county, a work which will be a laſting monument of a wonderful exertion of perſevering induſtry, gives Glouceſter an opportunity of conveying goods by water to London, Liverpool, Hull, and other great commercial places.

Prior to the accompliſhment of this work, it had a free intercourſe with Briſtol, and with moſt parts of Wales; and, in ſhort, with every coaſting and inland part of the country to which the Severn, or any river communicating with it, had an acceſs; ſo that the town is now eminently well fitted for any undertaking which requires the carriage of heavy articles; as for inſtance, ſugar-baking, breweries, vinegar-making, &c.

The ſoil of the city, on the eaſt and north ſides, and partly on the ſouth, is for the moſt part gravelly. On the weſt it is principally marl or clay. Laſt year, a gentleman, in digging a well of a conſiderable depth, in this quarter of the town, found ſeveral marine foſſils, in which ferrugineous particles were blended with the other ſubſtances. Beſides theſe he found only different coloured ſtrata of marl and clay.

Several ſituations in and about the town are admirably calculated for the building of new houſes, on account both of their pleaſantneſs and ſalubrity; eſpecially in Barton-ſtreet, which is on the eaſt of the town.

New markets, both handſome and commodious, have been lately erected, and are well ſupplied with all kinds of proviſions, and for the moſt part at reaſonable prices.

The ancient and beautiful cathedral will not go unnoticed by the curioſity of any viſitor; but to give a deſcription of this edifice, or to treat of other objects worthy of notice in and about the town, would be to extend this treatiſe beyond its proper limits.

The ſpring, of which I am now to give you the hiſtory, will, I make no doubt, contribute to the advantage and proſperity of this town. This water was firſt taken notice of about forty years ago, by a gentleman, who, when building the manſion now occupied by Mr. Lewis, ordered a well to be ſunk; and ſoon found that the water of this ſpring differed much from that of the town; but, owing to his being advanced in years, and at the ſame time thoroughly independent, did not think it an object worthy his attention, although well apprized of its medicinal virtues. The ſame reaſon prevented his daughter, who lived in it long after his deceaſe, from making any advantage of it; and was by them totally neglected, as by no means fit for domeſtic purpoſes. In November, 1787, the preſent tenant took poſſeſſion of the premiſes, and uſed this water for the firſt eight months while in the houſe, having no other, without going ſome diſtance; he all the time perceived it to be in every inſtance peculiarly different from any other; but as he was unacquainted with the reaſons, he was conſtantly mortified by finding it totally unfit for every purpoſe for which he wanted to apply it. He has informed me, that the linen waſhed therein was ſpoiled; and the water, when boiled for tea, uſed in brewing, or other culinary purpoſes, produced ſuch diſagreeable effects, as to defeat the intention for which it was uſed. The firſt cauſe which led him to conſider it as a medicinal water was, that a lady, then a lodger, upon mixing it with brandy, obſerved that a much higher colour, and an appearance totally different from mixing the ſame with ordinary water, were produced; from which circumſtance ſhe never uſed it afterwards, but obtained water from another part of the town. After he had lived ſome time on the premiſes, his wife, who had long laboured under nervous complaints, attended with a variety of ſymptoms, ſuch as dejection of ſpirits, langour, &c. and, having applied to medical men of note in Briſtol, Bath, and Glouceſter, without ſucceſs, at laſt determined to try the effect of this water; and in a few weeks her complaints greatly abated. The daughter was ſo violently afflicted with the ſcrophula, or King's Evil, that ſhe was at times blind, and loaded with ulcers, to the amount of thirteen in number, the marks of which are now to be ſeen. She was pronounced by the faculty incurable, and had uſed the Malvern waters without effect; but by the efficacy of this mineral ſpring was, in a ſhort time, greatly relieved.

Some time after this a profeſſional gentleman travelling with the biſhop of Cork, being convinced it poſſeſſed medicinal virtues, ſtrongly recommended it to a lady of their company, much affected with (as was termed by them) nervous weakneſs; ſhe regularly uſed it for a fortnight, and great benefit was received.

From this time it was ſuggeſted to the proprietor to have the water conveyed into a ſmall room by means of pipes, which he did, then advertiſed its virtues, and gave free acceſs to all who came; and upon a moderate calculation (as I am told) 400 perſons aſſembled of a day, moſt of whom received great benefit, and many cures were accompliſhed; a few particular caſes of which I ſhall mention at the end of this treatiſe. Since the laſt ſummer there has been added a very large and commodious pump-room for the nobility and gentry; the former pump being reſerved for the poor, who by applying will ſtill receive great attention as before.

I ſhall now lay before my readers the plan which I propoſe to uſe in the following treatiſe. I ſhall give an account of the general and particular experiments which were made, in order to acquire a proper knowledge of the contents of this water. 1ſt. From each experiment ſeparately, and afterwards collectively.

2dly. From the experiments made and concluſions drawn, I ſhall give an account of every diſeaſe in which this mineral may be of ſervice, together with certain principles, founded upon practice, why ſuch relief ſhould reaſonably be expected.

3dly. I ſhall lay down certain rules for invalids, with reſpect to the regimen to be obſerved while making uſe of the water, together with obſervations with reſpect to the quantity, times, and ſeaſons, for drinking the ſame.

I ſhall conclude the whole by relating a few well certified caſes, where relief and cures have been obtained.

CHAP. II.

AS water is univerſally known to be a ſolvent for a great variety of bodies in nature, it is eaſy to conceive that by paſſing through the bowels of the earth, it may meet with ſome one or more with which it may unite, and thereby ſuſpending the integrant parts of the ſame, may produce a ſolution; hence the name or epithet of mineral has been, with propriety, given to thoſe waters which have become impregnated with any heterogeneous matter that they may have accidentally met with in the courſe of their paſſage, whether flowing within or upon the ſurface of the terreſtrial globe; yet, as there are few waters, even amongſt the moſt pure, but what are impregnated with ſome ſubſtance, or earth, this would give riſe to too vague and extenſive a definition; therefore I think it neceſſary to confine the name of mineral waters to thoſe which, by having paſſed through certain veins of the earth, have diſſolved a ſufficient number or quantities of matter, which may produce a ſenſible effect on the animal œconomy, and thereby be rendered capable of curing or preventing certain diſeaſes, to which the human frame is daily expoſed.—From the above definition, the waters of the ſea, and ſaline ſprings, although not generally enumerated amongſt mineral waters, nevertheleſs ought equally to be conſidered as ſuch; for beſides earthy and ſelenitic matters, they alſo contain a lage quantity of mineral ſalts.

As chemiſtry is a ſcience which teaches the effects of mixture and of heat upon all bodies, whether natural or artificial, with a view to the improvement of arts, and of our knowledge of nature *; it is that upon which all our principles for the inveſtigation of the component parts of mineral waters are founded. From the above definition of chemiſtry my readers will naturally conclude, that there are two leading guides for our arriving at ſuch a knowledge, viz. that of mixing different ſubſtances, by which new compounds will ariſe; or, by the ſole application of heat.

To ſuch as may be unacquainted with the ſcience of chemiſtry, it may be neceſſary to explain

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* This definition is given by Dr. Black, in his Lectures on Chemiſtry.

the nature of theſe two principles; the firſt of which is founded on a ſimple fact; I mean, that all bodies have not an equal diſpoſition to unite with one another; but that there is a manifeſt gradation among all bodies in their tendency to form a union with each other; owing to this circumſtance, the component parts of many compounds may be ſeparated by the addition of a third body, which has a ſtronger attraction for the one of them than they had for each other when in a ſtate of union; a decompoſition takes place, and a new combination is effected. *E. G.* If with any acid, ſuch as the acid of nitre, calcarious earth, or chalk, is combined, the latter can be ſeparated by the addition of an alkali, which unites with the acid, and ſeparates the chalk; and as in many, or moſt of theſe caſes, the body thus ſeparated falls down to the bottom of the veſſel, ſuch bodies have been called precipitants *. The ſecond principle, viz. the application of heat, is founded upon our knowledge that bodies differ in volatility; hence the more volatile are ſeparated from the fixed by the operation of diſtillation, and can be afterwards examined apart. If the heat is ſo long continued that the whole of the fluid is evaporated, the ſolid contents remain behind, and the analyſis is ſaid to be made by evaporation.

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* Theſe, when made uſe of in the analyſis of waters, have been commonly termed chemical teſts.

Each of theſe methods was employed in the following analyſis; and I ſhall now, firſt, give the general characters of the Glouceſter water, and then proceed to relate my experiments, which were firſt made in a general way.

1ſt. The Glouceſter water, when firſt taken from the pump, and poured from one veſſel to another, emits numerous little bubbles of air, which attach themſelves to the inner ſurface of the glaſs, and riſe up to the top, aſſuming a briſk ſparkling appearance. By accident, a circumſtance occurred, when I was not engaged in making any particular experiment, I filled a large glaſs jar with this water, and inverted the ſame over a tub containing more water, by which means all communication with the external atmoſphere was excluded from the interior part of the jar; it continued in this ſituation a whole night, and the next morning I was much pleaſed with a very beautiful appearance; the whole ſurface of the jar was lined with veſicles of air, which, by uniting particularly at the top, formed (if I may be allowed the expreſſion) a moſt beautiful ſhell-work of air, in the thickeſt cluſters imaginable.

2d. Colour.—This water is never tranſparent, but at different times more or leſs turbid; in general it has a whitiſh cloudy appearance.

3d. To the ſmell it is rather inodorous.

4th. Taſte.—When drawn it is rather briſk, pungent, and refreſhing; afterwards rather auſtere, or rough, reſembling ink; but with reſpect to this quality, thoſe who make a point of attending the Spa, in a regular manner, will agree with me, that to the taſte it differs ſo very greatly, that hardly any two days together is the ſtrength the ſame. I ſhall have more particular occaſion to take notice of theſe frequent changes in the courſe of my experiments to be hereafter related.

5th. After being left in an open veſſel for a few hours it loſes entirely its pungency and briſkneſs; its roughneſs is greatly diminiſhed, and it depoſits a ſediment; hence, unleſs it is put into bottles well corked, it loſes great part of its medicinal virtues.

6th. This water is to be ranked among thoſe which are called cold; becauſe, whenever the thermometer is immerſed in any quantity, it conſtantly ſinks 8 degrees below the temperature of the atmoſphere.

7th. Its ſpecific gravity differs little from that of common water; if any thing, it is heavier.

I ſhall now proceed to inform my readers what the ſcience of chemiſtry pointed out to me in my experimental enquiry made at the pump.

The principal chemical teſts, or precipitants, made uſe of in the courſe of my experiments were,

1ſt, Syrop of violets, and infuſions of different blue and purple vegetables; all of which, when added to pure diſtilled water, are known never to produce any effect; but if poured upon waters impregnated with an acid, are changed to red; if an alkali prevails, to green;—the niceſt teſt to prove the predominance of either, is the tincture of lithmus. Although the ſyrop of violets has long held a place as a teſt of acid, or alkali, Profeſſor Bergman is diſpoſed to reject it altogether, as it is ſubject to fermentation, and is not always ſufficiently ſenſible of the aerial acid in water: this was tried with the Glouceſter water, and the effect produced was not ſufficient to ſpeak with a proper confidence. With the tincture of lithmus a very viſible effect was produced, I mean the change to red, which however only took place when the water was firſt drawn; and after it had been thus changed and expoſed to the air for a few hours, the colour gradually diminiſhed. Hence we may conclude, that the acid predominant in this water is of a volatile nature, which eſcapes upon expoſure to the air. Archil produced the ſame effects.

2d. A ſolution of ſoap was decompoſed by the water, viſible from the curdling of the ſame, which might be owing to the water containing any acid, either in its ſeparate ſtate, or combined with an earthy or metallic body; becauſe the alcaline part of the ſoap unites with the acid, for which it has a greater affinity or attraction than the oil with which it was before combined. It is neceſſary to obſerve on this occaſion, that the water was much more capable of making a lather with ſoap after it had been ſome time boiled, yet not ſo well as river water:—this is another argument in favour of what I before advanced, relative to the acid being of a volatile nature.

3d. Upon the addition of vitriolic an effervescence was produced, which might be occaſioned by its uniting with ſome one or more of the ſubſtances,

ſtances, in preference to the acid with which they were previouſly combined.

4th. Oil of tartar per deliquium, now called aqua kali, poured upon this water, produced a white cloud, and afterwards a ſediment, which was rendered clear upon the addition of a few drops of vitriolic acid. Spirit of ſal ammoniac produced the ſame effect, and the water was again rendered clear by the addition of any acid. From this experiment I was naturally induced to ſuſpect the preſence of an abſorbent earth, either calcarious or magneſia, which was diſunited from its acid, owing to the alkali having a greater attraction for it than either of the abſorbents had, which was conſequently precipitated, but re-diſſolved by the addition of more acid.

5th. The cauſtic volatile alkali, or aqua ammoniæ puræ, produced a precipitate of a brown colour, approaching to an ochreous nature.—The cauſtic fixed alkali, or ſolution of kali purum, produced a precipitate of two different colours, white, ſlightly intermixed with brown.

From the foregoing experiments we have ſufficient reaſon to aſſert, that the effects produced were owing to an acid exiſting in the water which is itſelf fugitive, as it eſcapes by expoſure to the air, and is eaſily ſeparated by the addition of a third body, which unites with one or more of the ſubſtances therein contained: for were the ſame experiments repeated on diſtilled water, no ſuch effects would ariſe; nor could any earth, whether calcareous, magneſian, aluminous, or metallic, be ſuſpended, unleſs there was preſent ſome acid, either in the form of aerial gas, or in that which is natural to the acids in general; but neither of theſe experiments have yet given us any knowledge of the nature of the acid which keeps the particles of the different ſubſtances ſuſpended, nor of their nature when ſeparated.

6th. The next teſt I made uſe of was lime-water; when dropped into any quantity of the Glouceſter water, it produced at the inſtant a plentiful thick white cloud, which could be owing to no other cauſe than that of the lime's uniting with ſome acid, which rendering it inſoluble, were both thereby precipitated, either in the form of chalk, if fixed air was preſent—or gypſum, if vitriolic acid; becauſe lime has a greater attraction for fixed air than any other body, terra ponderoſa excepted; and it could not ſeparate any body united with the vitriolic acid, except magneſia, and the metals which might be known by the colour of their precipitates. For the uſe of this teſt, in the analyſis of waters, we are much indebted to Dr. Black, profeſſor of chemiſtry in the univerſity of Edinburgh, whoſe experiments on calcareous earth and magneſia have ſo much increaſed our knowledge of the nature of fixed air, both in its ſeparate ſtate, and when combined with other bodies, as alſo of the different degrees of attraction it has for various chemical bodies, that he has excited an ardour for new diſcoveries, and thereby formed one of the moſt brilliant epochs in his ſcience. We have reaſon then to expect, that the name of Black ſhould always remain memorable in the annals of chemiſtry, and be handed down to poſterity as long as the ſcience itſelf ſhall exiſt. From his experiments it is now known, that lime owes its ſolubility in water to its being deprived of its aerial gas, known commonly by the name of fixed air, and to poſſeſs the properties of an acid; that if to this ſolution this gas is added, the lime is ſeparated and reaſſumes the form of chalk, which being inſoluble in water falls to the bottom, and forms the precipitate above-mentioned. He has proved that lime has a greater attraction for this air than for either the vegetable, foſſil, or volatile alkalies.

From the laſt mentioned experiment made on the Glouceſter water, there is reaſon to impute the white precipitated matter to the fixed air being united to the lime, which is thereby rendered inſoluble, and reduced to the ſtate of calcareous earth, natural to it, previous to its calcination.

It may at firſt appear unintelligible to ſome of my readers, why this aerial acid ſhould render calcareous earth inſoluble, when I have juſt mentioned that it is by means of the ſame that it is kept in ſolution; I will, however, endeavour to explain this, by informing them of one ſingle fact, viz. that although lime is made inſoluble by fixed air, which renders it the ſame as chalk, yet, by the introduction of a greater quantity of the ſame acid, it is re-diſſolved; the lime-water, therefore, when mixed with waters containing fixed air, will imbibe all the ſuperabundant quantity, and the lime will thereby be rendered inſoluble.

The preſence of fixed air as an acid will account for the change produced upon the infuſion of lithmus, and the ſolution of ſoap; becauſe, when the water was expoſed to the air, the acid eſcaped in its uniform ſtate. That there is another acid which ſuſpends the particles of other bodies in this water, will be rendered manifeſt in the courſe of ſome ſubſequent experiments.

7th. I next tried the effects produced upon the water by a few drops of an infuſion of galls. The effects varied at different times. I have been able one day to produce a very deep purple, although upon another trial a much ſlighter change was occaſioned. This aſtringent vegetable, whether made uſe of in the form of infuſion by water, or tincture made by ſpirits of wine, readily diſcovers iron, and ſlowly precipitates it from water; in proportion to the quantity of iron therein contained, the colour produced is more or leſs purple. It is almoſt needleſs for me to make any comment upon this experiment, as the property of its infuſion, or tincture, producing a change in any water containing iron, is ſo well known to thoſe who are ever ſo little ſkilled in the ſcience of chemiſtry. Dr. Forthergill, in his Analyſis of the Cheltenham Water, obſerves, that the colour of this precipitate varies according to the nature of the acid by which it is ſuſpended. If the iron be vitriolated, the precipitate is of a dark blue, inclining to black; if the iron is aerated, that is to ſay, ſuſpended by aerial acid, a purple is produced. In my experiments the latter always took place; which circumſtance, joined with others hereafter mentioned, prove that the iron in this water is aerated. The ſame effects as with the galls I produced by infuſions of tea, and various others aſtringents, although differing in degree; from which I can have no doubt of iron being combined with the water.

8th. The phlogiſticated, or Pruſſian, alkali was next made uſe of as one of the niceſt teſts of the preſence of iron contained in any water, which it diſcovers by producing a beautiful Pruſſian blue, whenever it comes in contact with this metal; but in order to accompliſh this end, an acid is always neceſſary. Theſe two, when poured on the Glouceſter water, cauſed this effect; and the liquor, after having been ſet by for a ſhort time, depoſited a fine powder.

But as the Pruſſian alkali is the moſt delicate teſt of the preſence of iron in any liquid, it may, from this circumſtance alone, give riſe to falſe and erroneous concluſions, unleſs two particular points are attended to. 1ſt, Great care muſt be taken in the choice of the vitriolic acid, which is made uſe of in ſeparating the colouring matter from the alkali; and, 2dly, The preparation of the phlogiſticated alkali requires much circumſpection;

ſpection; the reaſons for which will appear from the following facts: It would be foreign to a work of this nature to enter into a theory of the making of Pruſſian blue; nevertheleſs, a few obſervations are neceſſary.—Firſt, Neither the vitriolic, nor any other acid, ſingly, has any action upon the colouring matter combined with the alkali.

Secondly, Iron will no more produce a precipitate from the alkali than the acid, yet they are both neceſſary to produce the deſired effect; becauſe the united affinities of iron and acid act together on the compound of the alkali and the colouring matter; the iron ſeizes on the latter, with which it forms the Pruſſian blue; the vitriolic acid being then ſet at liberty, combines with the fixed alkali, and forms with it a vitriolated tartar; therefore two decompoſitions take place; and, conſequently, two new combinations are effected; this then is an example of double affinities, as being produced by the mixture of four bodies.

As this alkali is ſo uſeful a precipitant for the diſcovery of iron, we muſt firſt be certain of the nature of the acid employed to ſeparate the colouring matter. The vitriolic acid may contain a ſmall quantity of iron, becauſe a great part of this acid, which is bought from trading chemiſts, is often diſtilled from calcined vitriol; in which operation a ſmall portion of the metal therein contained may ariſe with it; which acid, when added to the Pruſſian alkali, in any liquid, may give riſe to a falſe aſſertion, that iron was contained in the water, although in reality this metal was combined with the acid.

The ſecond circumſtance to be attended to, is the preparation of the alkali for this purpoſe; which is made by calcining equal parts of vegetable alkali with ox's blood; the reſidue is then put into boiling water, in order that the ſaline matter may be diſſolved; the liquor is then filtered, and a phlogiſtic alkali lye is obtained. Various have been the theories formed upon the effects produced by this alkali, when applied to mixtures wherein iron is contained: and I may even now ſay, that very little is known reſpecting it.

Mr. Fourcroy, in his treatiſe upon the nature of mineral waters, and their analyſis, has entered at ſome length upon the uſe of this alkali, as a teſt in diſcovering their contents; and ſays it is by no means to be relied on, becauſe it may contain a ſmall portion of iron. He conſiders its colouring matter to be of an acid nature, which can be united with alkaline ſubſtances; this idea has ſuggeſted to him the means of producing a Pruſſian alkali, entirely free from the leaſt particle of iron, and will be the moſt certain teſt of its preſence in water: this proceſs conſiſts in digeſting Pruſſian blue with lime-water; the blue then aſſumes the appearance of ruſt, and the lime-water a beautiful yellow colour; it is then filtered, and has loſt every characteriſtic mark of an alkaline nature; that is to ſay, it is neutraliſed by the acid colouring matter which formed blue, and thereby becomes a nicer teſt of the preſence of iron, owing to its not containing the ſmalleſt particle of that metal. I have made uſe of this preparation and the common alkali in the following analyſis, and the blue was always produced; neither of which, when added to diſtilled water, produced any effect.—I thought myſelf in ſome meaſure obliged to enter upon this ſubject at a greater length, owing to my having been fruſtrated in ſome of my experiments at Glouceſter, when made before a profeſſional gentleman of eſtabliſhed character and diſtinguiſhed abilities; the difficulties which then occured I promiſed to explain; I have therefore endeavoured to ſatisfy him on this ſubject. I might poſſibly be more able to do it, was I permitted (which would be thoroughly incompatible with a work of this nature) to enter fully into the theory of any particular object in chemiſtry.

I made uſe of one more teſt, in order to be certain of the preſence of iron; which was, the introducing, by means of an apparatus, to be hereafter mentioned, a quantity of Hepatic gas into an inverted veſſel, full of water; in proportion as the air aſcended, the water made its eſcape. I ſtopped the proceſs when nearly one half of the water was ſeparated the upper part was then full of air, and the under contained the remaining water. I then removed the veſſel carefully, avoiding any communication with the atmoſphere; and, after repeated agitation, in an hour the water was changed to a deep black colour, from its having imbibed a portion of the gas. It is the property of this air to change the colour of all metallic calces, which, according to the explanation of the advocates for phlogiſton, is owing to the phlogiſtic vapours of the ſulphur uniting with the calx, and thereby reviving the iron in its metallic form. Or, according to the antiphlogiſtinarians, is explained by the Hepatic gas decompoſing the calx, and abſorbing the oxgenous* principle, which is neceſſary for the calciformed ſtate of all metals; which, being ſeparated, the metal re-aſſumes its natural and moſt ſimple form. Let either of theſe theories be right, the fact is the ſame, and is generally conſidered as a proof of the preſence of ſome metal; and, from the two former experiments, we need have no doubt that it is a calx of iron.

I ſhall now proceed to the precipitants made uſe of to diſcover the nature of the acids which might be united with the different ſubſtances. Upon pouring a few drops of a ſolution of ſilver in nitrous acid, a white cloud was produced, which might ariſe from various decompoſitions of ſaline or earthy ſubſtances taking place; the difference in appearance is various, becauſe this acid will unite with any of them in preference to the ſilver; and the ſilver would unite either with the vitriolic or muriatic acids, in preference to the nitrous.

When the ſilver unites with either the vitriolic acid or marine, forming with the latter an inſoluble compound, called Luna Cornea, the precipitate aſſumes the form of ſtreaks; whereas in the decompoſition of earthy bodies, a more general cloud was produced. The former effect took place in my experiments: hence I conclude the precipitate was formed by the ſilver uniting with one of theſe acids, in preference to the nitrous. The difference of this may be known to experienced chemiſts. I have generally obſerved that the precipitate formed under the name of Luna Cornea, ſooner aſſumes a black colour when expoſed to the light of the ſun.—I ſpeak not to a certainty.

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* This is derived from the Greek, viz. οξυς, acutus; & γινομαι, facio.

In order the better to diſcover the nature of the acid, I made uſe of a ſolution of mercury in the nitrous acid, which is decompoſed whenever it meets with the vitriolic or marine acids; whether ſingle, or combined with other ſubſtances, the mercury quits the nitrous, and unites with either of the former; the nature of which is eaſily known by the colour of their precipitates; that formed by the mercury uniting with the marine acid is white, while that of the vitriolic is yellow, and known by the name of Turbith Mineral. In all my experiments a yellow precipitate was obtained when this ſolution was mixed with the Glouceſter water. But for this purpoſe the ſolution of mercury ought to have a ſuperabundant quantity of acid; for this ſolution, when perfectly ſaturated, forms a precipitate with even diſtilled or any other water; and it is upon this account that a ſolution of mercury, made without heat, is recommended in preference to the one made with heat. This was attended to in the analyſis of this water.

To be ſtill farther certain of the nature of this acid, I made uſe of a ſolution of Saccharum Saturni, or ſugar of lead, which produced a white cloud; this might alſo be owing to ſeveral decompoſitions taking place; as calcareous earth, or an alkali, would have had almoſt the ſame effect: but this precipitate is eaſily diſtinguiſhed by the addition of a little diſtilled vinegar, by which it would have been re-diſſolved; whereas, was the ſeparation formed by the lead with the vitriolic acid, it would have remained inſoluble. From the two laſt experiments we have ſufficient reaſon to aſſert, that another acid is combined with ſome of the ſolid contents in this water, by means of which they are kept ſuſpended, and that there can be no doubt of its being the vitriolic.

I ſhould be fearful of wearying my readers, were I to enumerate any more experiments made in this general manner, as chemiſts are abundantly furniſhed with precipitants for this purpoſe.—Few can diſcover more than the preceding; nor do I believe, there are any which can render the component parts more manifeſt. And I am inclined to believe that the multiplying of experiments would rather tend to confuſe than elucidate; I ſhall therefore deſiſt from enumerating any more of theſe, and immediately proceed to thoſe made on a larger ſcale.

One of my firſt obſervations, mentioned in a former part of this treatiſe, was, that a briſk and ſparkling appearance took place upon pouring this water from one glaſs into another, when firſt drawn from the pump; and that the inner ſurface of the glaſs was covered with little air bubbles. From which circumſtance alone I was inclined to believe that the water was plentifully ſtored with air; and from my former experiments with lime-water, by which I concluded it to be fixed air, I was led to make the following experiment: I put one quart of this water into a glaſs long-necked retort, which was about half filled; the end of which I plunged into a large tub of common water; over this I inverted different jars, filled with the ſame; by which means all communication between the inner part of the jars and the external atmoſphere was excluded. The apparatus thus fixed for the ſeparation and collection of airs, has been, by the French, named "L'appareil pneumato chymique;" for which, whenever I have occaſion to mention it again in the courſe of this analyſis, I ſhall make uſe of the term "Pneumato," chemical apparatus. I applied heat to the bottom of the retort; ſoon after which air began to be ſeparated in ſmall quantities, and by very ſlow degrees; which paſſing into the jars, cauſed the water to eſcape in proportion; and, according to the heat of the water, the air paſſed in greater quantities. After it had arrived at the heat of boiling water, the air was ſeparated in a more rapid manner. I continued this proceſs till the air was entirely diſcharged; and the water in the tub ruſhed into the retort, owing to a vacuum being formed between the end of its neck and the ſurface of the water. The air, which was collected in ſix different veſſels, each containing eight ounces by meaſure, the whole conſequently amounting to 48, was examined by means of lime-water and nitrous air: upon agitating the air contained in the firſt veſſel in lime-water, a muddineſs and cloud were formed, and a great part of the air was abſorbed by the lime; in the ſecond a much greater was produced; the lime-water, owing to its imbibing the air, aſcended in the veſſel to above half its height; and in all the others it aſcended ſtill higher. The quantity of air remaining from the whole, which was not effected by lime-water, amounted to 20 ounces; which was afterwards examined by the mixture of nitrous air with which it effervesced, and ſuffered a diminution in the ſame proportion as common atmoſpherical air. From this experiment I draw the following concluſion: that the precipitation produced by the lime-water, was becauſe the fixed air of the Glouceſter water, uniting with the lime, and being thereby abſorbed, formed common calcareous earth in the form of chalk; it likewiſe had the other characteriſtic marks of this acid; hence I infer, that in one quart of this water 28 ounces of fixed air are contained; and the remaining air, not affected by lime-water, was ſimilar to atmoſpherical air, which was chiefly contained in the vacant ſpace between the end of the neck of the retort, and the ſurface of the water; and partly, although in ſmall quantities, in the contents of the water itſelf.

From the ingenious experiments made by Dr. Black before-mentioned, we are taught that this air poſſeſſes all the qualities and characters of an acid, which is likewiſe confirmed by Profeſſor Bergman; it is capable of being united with various ſolid ſubſtances as well as fluid; and ſuch ſubſtances, according to the preſent Nomenclatura of chemiſtry, when ſaturated with fixed air, are ſaid to be aerated, that is to ſay, they are ſuſpended by an air, having the qualities and characters of an acid, in the ſame manner as ſuch ſalts which are ſaturated with vitriolic acid are denominated by the term of vitriolated. This acid is capable of ſuſpending various other bodies. The Honourable Henry Cavendiſh has endeavoured to prove, that various earths may be likewiſe ſuſpended in water, by their being furniſhed with more than their natural quantity of fixed air, and ſhewn by experiments that this is the caſe in the Rathbone-Place water; from thence he concludes, that the unneutralized earth in all waters, is ſuſpended by the ſame means, and juſtly obſerves, that it is very remarkable that earths ſhould be rendered ſoluble in water, both by depriving them of their fixed air, and by furniſhing them with more than their natural quantity of it. That iron can be ſuſpended in water by means of this gas, is fully eſtabliſhed by the common experiment of impregnating waters with fixed air, by means of Nooth's apparatus. This acid conſtitutes the mineral ſpirit of moſt of the celebrated mineral waters, the eſcape of which will explain the change ſuch waters undergo when they contain it in any conſiderable quantity. Upon this principle we can eaſily underſtand how, from expoſure to the open air or heat, they will looſe all their ſtimulating and invigorating powers, their pungency of taſte, and likewiſe the depoſit of the ſolid ſubſtances therein contained.

From the volatile nature of this aerial acid, we can underſtand the reaſon of the changes produced every day upon ſuch waters, not only with reſpect to their briſkneſs and clearneſs of appearance, but likewiſe to the quantities of ſubſtances held in ſolution by this acid. During the whole fortnight I remained at Glouceſter, I could never, for two days together, produce the ſame effect with reſpect to quantity, although the experiments before-mentioned were repeatedly made after the ſame manner; this could be owing to no other cauſe, than that in different ſtates of the atmoſphere the aerial acid or fixed air eſcaped in larger or ſmaller quantities, and of courſe their ſolid contents ſubſided to the bottom of the well, by which means the water became leſs impregnated with the different minerals.

It would be needleſs for me to mention other effects of this acid; I ſhall therefore conclude this ſubject in the words of Dr. Aſh*, "That the diſcoveries of Dr. Black, Profeſſor Bewly, Bergman, and others, have demonſtrated the acid nature of fixed air, and have at laſt produced one uniform and ſimple ſyſtem; and perhaps have left us little more to learn with reſpect to its properties as an agent in the formation of mineral waters."

I ſhall therefore proceed to my ſecond experiment made on the large ſcale.

Experiment 2d.—I put two quarts of Glouceſter water into a large glaſs jar, upon which I poured lime water, till it ceaſed to make any further cloud or precipitate; for this purpoſe a pint and a half were uſed; the liquor, after remaining twenty-four hours, was filtered, and the

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[*] Vide his experiments and obſervations on the waters of Spa and Aix-la-Chapelle, page 25.

depoſit was ſeparated and dried. I tried moſt of the precipitants upon the liquor, by which no effects were produced; a ſmall white cloud however appeared on the addition of a few drops of a ſolution of ſilver in the nitrous acid. The precipitate, which was of a whitiſh brown, weighed forty-five grains and a half; it was not ſoluble in diſtilled water. When I added vitriolic acid, an effervefcence took place, owing to the ſeparation of the fixed air, which had been imbibed by the lime; it formed ſoon after a white depoſit, inſipid, thoroughly inſoluble, which proved to be ſelenite, formed by the union of the calx with the vitriolic acid. I filtered the liquor, to which I then added lixivium Tartari, and produced a fine white precipitate, reſembling magneſia in appearance, taſte, and chemical qualities; becauſe when re-united with the acid of vitriol, I obtained Epſom ſalts: the weight of this precipitate, when ſeparated and dried, amounted to twelve grains.

From this experiment I concluded, that in two quarts of this water twelve grains of magneſia were contained, chiefly ſuſpended by aerial acid; becauſe, had it been ſuſpended by the vitriolic acid forming Epſom ſalt, it would, as being a ſaline ſubſtance, have been ſoluble in water before the vitriolic acid was added.

If an explanation of the effects exhibited in this experiment ſhould be required, I would give the following.—Primo, the precipitates being inſoluble in water, was cauſed by the lime imbibing the ſuperabundant fixed air, which has been ſo thoroughly ſpoken of before, that nothing more can be neceſſary; the addition of the vitriolic acid cauſed an effervеſcence, and uniting with the lime, formed an inſoluble compound, known by the name of *gypſum ſelenite*, or *alabaſter*; ſome portion of this acid did combine with the precipitated earth of magneſia, and thereby produced a ſoluble ſalt, which was taken up by the water. Upon this ſolution, when the lixivium of tartar was poured, another precipitate and a double decompoſition took place, viz. the alkali united with the acid of vitriol, and formed vitriolated tartar, while at the ſame time the fixed air from the lixivium attached itſelf to the earth of magneſia, and thereby reduced it to the ſame ſtate as when combined with the Glouceſter water.

Experiment 3d.—I put two quarts of Glouceſter water into another jar, ſimilar to the for-

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mer, upon which I poured an ounce of the cauſtic fixed alkali, whereby a whitiſh cloud was formed, and a ſediment produced, which was ſeparated by filtration and dried. The liquor was tried by all the precipitants; the Pruſſian alkali with an acid produced a blue; the other teſts cauſed no change. The precipitate weighed thirteen grains and a half, which were entirely inſoluble in water; upon the addition of vitriolic acid an effervеſcence aroſe, and a perfect gypſum was produced; hence I was inclined to conclude, that the whole thirteen grains and a half ſeparated were nothing more than calcareous earth, partly ſelenetic, and partly aerated.

Experiment 4th.—In this trial I poured fourteen drachms of phlogiſticated alkali upon the ſame quantity of the Glouceſter water as in the two former experiments; the precipitate appeared ochreous, which, upon the addition of the acid of vitriol, changed to a beautiful bright blue; when ſeparated by filtration and dried, it weighed nine grains. I repeated the ſame experiment, in order to have double the quantity of precipitate for examination. The powder of each, mixed together, weighed nineteen grains; the whole was then put into a crucible, and a ſtrong heat applied;

plied; the blue colour was entirely diſcharged, and the powder then had the appearance of calx of iron, or ochre, and weighed thirteen grains. I then tried if any part of it was ſoluble in vinegar, and found that when ſeparated again, it had loſt five grains, which I looked upon to be calcareous or magneſian earth, accidentally precipitated by the alkali made uſe of, and that they were diſſolved by the vinegar. The eight grains which were not ſoluble in this acid proved to be the calx of iron. I concluded from this experiment, that in one gallon of Glouceſter water, eight or nine grains of iron are contained.

I now come to ſpeak of the laſt experiment, in which moſt chemical profeſſors place the greateſt confidence; I mean, that by diſtillation and evaporation; this is conſidered as the moſt certain method of obtaining all the principles contained in mineral waters.

Objections have been made to the uſe of teſts, as well as that of evaporation; the former have been conſidered as ſimply indicating the quality of the component parts, but not determining the real quantities of each. The proceſs of evaporation has been objected to by Mr. Fourcroy, becauſe that the action of heat ſufficient to evaporate

porate the water, may produce ſenſible effects upon the principles therein contained, and thereby render the reſidium diſſimilar to the compounds originally exiſting in it. As both theſe methods were made uſe of in this analyſis, we may be able to judge with greater certainty, both of the qualities and quantities of the component parts of the Glouceſter water.

Experiment 5th.—Two quarts of this quarter were poured into a glaſs retort, and diſtilled to within five ounces to dryneſs, nothing volatile paſſed through the juncture of the retort and receiver. During this operation I obſerved the following phenomena: ſoon after the heat was applied, the ſeparation of air was viſible by the numerous bubbles emitted; a pellicle was ſoon formed on the ſurface of the water, which after encreaſing gradually, began to break and fall down to the bottom of the veſſel. This was nothing more than the different earths rendered inſoluble in the water, from their being deprived of their aeral acid.

The liquor which was diſtilled over into the receiver was perfectly tranſparent and inſipid; it was tried by all the precipitants, and no effect or change whatever produced. Three parts were then evaporated away, the remainder was ſet by in a cold place, in order to ſee whether any cryſtalization would enſue; it remained there a whole night, and no change was obſerved; in ſhort, the water was ſo pure that it might be uſed for the niceſt experiments, like other diſtilled water prepared for the purpoſe. I next examined the liquor and powder remaining at the bottom of the retort; the powder was of a brown colour, and weighed thirty-five grains; the ſix ounces of liquid were high coloured when filtered, and very ſaline, containing a neutral ſalt, the acid of which proved to be the vitriolic; for when I put a few drops of it into diſtilled water, and then added one drop of a ſolution of mercury in the nitrous acid, a turbith mineral was produced: the alkaline ſubſtance proved to be earth of magneſia, becauſe, on the addition of lixivium tartari to a few drops put into diſtilled water, a white magneſia was produced; the remaining liquor was then ſtill further evaporated till reduced to one ounce, which when ſet by to cryſtalize, yielded of Epſom ſalt fifteen grains.

The powder was next the object of examination. Upon this I poured two ounces of ſpirit of wine highly rectified; the veſſel was ſhaken and well ſtopped; the liquor after having ſtood ſome hours was filtered, I then weighed the reſiduum which was not ſoluble in ſpirits of wine, and found that it had loſt nothing in weight; from which I was certain, that although this water contained calcareous earth and magneſia, yet they were not combined with the muriatic acid, becauſe each of theſe earths, when neutralized by this acid, are ſoluble in ſpirits of wine, although not when combined with the vitriolic. This is an additional reaſon in favour of the preſence of the vitriolic acid.

Upon this I next poured boiling diſtilled water, which I ſuffered to remain a whole night; the powder when ſeparated was not diminiſhed; the liquor when filtered was nearly inſipid; it was afterwards evaporated, and no cryſtalization appeared; hence there was reaſon to ſuppoſe that no ſaline ſubſtances were taken up from the powder in this operation. I was from this circumſtance certain that what remained was of an earthy nature; and on account of its brown colour, and the reſult of ſome former experiments, I had no doubt of iron entering into this compoſition. I next digeſted it with a gentle heat in diſtilled vinegar; the greateſt part of it was then diſſolved.

The ſolution when filtered was next examined by means of the acid of vitriol, by which I obtained a ſelenite, formed by the union of the vitriolic acid with the chalk, and Epſom ſalt, formed by the union of the earth of magneſia with the vitriolic, which as being ſoluble was held in ſolution in the liquor above. Theſe were both examined apart; from the one I obtained of magneſia twelve grains, and the others of calcareous earth fifteen grains.

The powder which remained inſoluble in the acetous acid weighed four grains, which proved to be calx of iron.

I have now related to my readers the reſult of all my experiments, and hope that if there are any inaccuracies in the concluſions drawn therefrom, they will be viewed with an eye of candour, and attributed to the ſhortneſs of the time allotted me for my undertaking.

From the general experiments I think it will appear demonſtrated, that in this water are contained fixed air, calcareous earth, magneſia and iron; and from my experiments when made upon the larger ſcale, I think that theſe ſubſtances exiſt in the following quantities in each gallon of this water.

Of fixed air, or acidulous gas, by meaſure	28	oz.
Calcareous earth combined with the ſame	30	grs.
Aerated magneſia - - -	24	
Aerated iron - - -	8	
Epſom ſalt - - -	30	

I cannot conclude the analyſis without comparing the Glouceſter water to thoſe ſituated near the German Spa. They all contain the ſame materials, except that in the latter a ſmall portion of mineral alkali and ſea ſalt are combined, which I have not been able to diſcover in any of my experiments upon the former. It has been ſhewn by others from their analyſis, that a larger quantity of fixed air is preſent in them than in the one ſubmitted to my examination.

Upon the whole, there appears a great ſimilitude between them in their other contents; and that where benefit is to be expected from the one, it may alſo be hoped for in the other.

I ſhall now conclude this part of my treatiſe, and in the next chapter conſider the various diſeaſes in which this water may be of ſervice.

CHAP.

CHAP. III.

IN this part of my treatiſe it was my intention to have confined myſelf to merely giving an account of the diſeaſes in which this mineral water may be of ſervice; but, with the permiſſion of my readers, I muſt beg leave firſt to dwell a ſhort time upon the uſe and abuſe of mineral waters in general.

In the ſame manner as the fame of men has often encreaſed or decreaſed from trivial accidents, ſo likewiſe have ſome medicines frequently acquired very high repute without poſſeſſing any real or eſſential merit; while others of genuine worth have, owing to miſapplication, or falſe concluſions drawn from their operations, fallen into diſrepute. Thus the public have, I believe, often been deprived of very valuable remedies by too raſh and imprudent uſe of them at firſt; but in no inſtance is this more fully exemplified than in the drinking of mineral waters; in theſe, as in many other inſtances of human life, the nobleſt bounties of nature are often abuſed.

The greater part of mankind are, I am ſorry to own, too fond of being their own phyſicians at all times, and at the beginning of moſt diſeaſes; till, after tampering with their conſtitutions for a length of time, the diſeaſe has gained ſuch power that medical advice comes too late; and death is the effect of their folly.

With reſpect to the drinking of mineral or chalybeate waters, men in general will be governed by their own opinions, or thoſe of their friends, who, for want of company, will oftentimes inconſiderately induce them to follow their examples; by which imprudence many, who in health having wantonly tried the experiment, have produced violent acute diſeaſes, or ſown the ſeeds of ſome inveterate chronic diſorder, and be obliged to drag on a wretched and miſerable exiſtence to the remainder of their days. One cauſe then of a mineral water's not gaining the credit it may deſerve, is the drinking of it without previous medical advice; ſurely then it behoves every one to pay attention to this circumſtance, and never to ſuffer himſelf to be led away by the importunities of his friends. Medical men there are, beyond all doubt, who from having no faith in the uſe of ſuch waters, or any native chalybeate yet known, may in ſome meaſure diſſuade their patients from frequenting ſuch places; but theſe men I would adviſe my readers to aſk this ſimple and plain queſtion, viz. Can any harm, in certain caſes, be derived from the uſe of them? if they are anſwered in the negative, I then leave it to their own diſcretion, which ought to guide them, to give ſuch waters a fair trial before they condemn them.

A ſecond cauſe of mineral waters either gaining or loſing credit, is the manner of taking them, as it reſpects the quantity or frequency of uſe; for, as they are generally to be uſed only in chronic diſeaſes, moſt of which have exiſted for a long while, the effect of habit is with difficulty overcome; and people, not aware of this circumſtance, are unwilling to give them a fair trial, either through ignorance or impatience; by which means ſuch waters have often fallen into diſcredit. Upon this ſubject Dr. Oliver makes a very juſt obſervation: “ Patients (he ſays) inſtead of following the rules laid down for their conduct, torment themſelves continually with doubts and ſcruples: by harkening to the opinion of every pretender, they come to have none of their own to act by. They trifle away their whole time after a fruitleſs ſearch after what they ſhould do, inſtead of doing what they ought, till at laſt, finding they receive no benefit, or are worſe than when they came, they condemn the waters, and quit them in diſguſt."

There is an oppoſite abſurdity, of which daily inſtances may be ſeen, from a ludicrous idea that too great a part of the world entertain, I mean the impoſſibility of having too much of a good thing; hence the bleſſings of life too frequently become the ſources of miſery: thus, although the drunkard may at the latter part of his days condemn the generous juice of the grape; yet I believe no one will deny that wine, which may deſtroy the intemperate man, is adapted for the ſupport of life, when uſed with moderation and judgment.

Other cauſes there are which may be of diſadvantage to watering-places—the want of good regulations in exerciſe, diet, ſleep, and public amuſements. With reſpect to the latter, I ſhall ſay a few words, and paſs over the three former, until I come to ſpeak of the regimen, which I would wiſh to lay down for the uſe of invalids reſorting to this mineral ſpring.

Although it is by no means my deſire to depreciate the medicinal properties of mineral waters; nor do I think that the minds of people frequenting theſe places, are neceſſarily affected with diſagreeable and painful anxieties (which however may frequently be the caſe), yet I have no doubt, and it is univerſally allowed, that medicines of the greateſt virtue would often fail, were there not means to divert and amuſe the mind, and thereby aſſiſt them in their operation.

This obſervation is not confined to the hypochondriac alone, but is equally applicable to invalids in general. Many there are who, from want of employment, would paſs their time in ſuch a ſtate of inſipid inactivity, that the ſtimulating and cordial powers of a mineral water would ſoon ceaſe, and thereby loſe their efficacy, were it not for the exhilerating influence of public amuſements. Although I am ſuch an advocate in their favour, yet I muſt acknowledge that unleſs they are ſo well regulated as to prevent exceſs, the whole of the intentions would be fruſtrated.

The city of Glouceſter and its environs are ſo well known, that it is unneceſſary for me to add to what is already mentioned in my firſt chapter, owing to its being ſurrounded with beautiful hills and vallies; the rides and walks are numerous and delightful; the town has agreeable amuſements; public breakfaſts twice a week during the ſeaſon; balls, concerts, and a theatre.

From the chemical analyſis given in the preceding chapter, we find that this ſpring contains a conſiderable quantity of fixed air, iron, calcareous earth combined with acidulous gas, magneſia, and Epſom ſalts; hence it may, with propriety, be called a native chalybeate water. My next object will be to inform my readers of the diſeaſes in which this water may be ſerviceable. I ſhall for this purpoſe mention the virtues which each of the conſtituent parts of this water poſſeſs in their ſeparate ſtate, beginning with iron.

This valuable metal has long been known in the practice of phyſic, for its great utility in a number of diſeaſes, proceeding from laxity of fibres, and in local as well as general debility. It has very properly been ranked under the claſs of tonics, among which it ſtands almoſt the firſt, and is uſed only in chronic diſeaſes depending upon ſuch cauſes. Here it may be neceſſary to explain the uſe of two technical terms in the ſcience of medicine. Chronic is a term derived from the Greek word χρονος, or chronos, ſignifying time; comprehending, therefore, diſeaſes which have been of long ſtanding, and in which there is not immediate imminent danger, in order to diſtinguiſh them from the oppoſite diſeaſes called acute; of which kind are fevers, pleuriſies, inflammations, &c. &c. by which the ſick are generally confined to their beds, and their diſeaſes terminate, either favourably or unfavourably, in the ſpace of a few days: in theſe the pulſe is generally full, quick, and throbbing, and evacuations are neceſſary; in the former, muſcular motion is performed with difficulty; the pulſe is languid and feeble, and general debility prevails. Hence, in chronic diſeaſes ſtrengthening remedies are required; and as the ſtrength of muſcular parts is ſuppoſed to depend much upon the tenſion of their fibres, ſuch remedies as produce that effect are called tonics.

This metal is almoſt the only one which is not virulent; it is often ordered in preſcriptions in every ſhape, both that of its metallic ſtate, and that of its calciformed; by which is meant, iron in the ſtate of ruſt. It is alſo uſed when united with an acid, which is one of the moſt common principles that keeps it ſuſpended in mineral waters. The great advantage certainly proceeds from its tonic and ſtrengthening qualities. It produces a ſlight and gentle irritation of the fibres, and thereby the ſenſible organ of the body on which it may act are conſtringed, and an additional force and elaſticity neceſſarily produced. By its being applied immediately to the fibres and veſſels of the ſtomach and inteſtines, the moſt ſalutary effects are produced in thoſe diſeaſes which are derived from the inactivity of the digeſtive organs; for which reaſon it is a remedy oftentimes given in caſes of dyſpeptia, or indigeſtion, and loſs of appetite, attended with crudities and flatulencies. Dr. Cullen, in his excellent book entitled his Lectures upon the Materia Medica, ſpeaks thus highly in favour of the virtues of iron, viz. "In all caſes of laxity and debility, and in obſtructions and ſlowneſs proceeding from theſe cauſes, iron is employed, though other ſimple aſtringents might alſo anſwer the effect. Here we ought to be aware of too ſudden an aſtriction, which might be attended with bad conſequences; and, therefore, in exhibiting it in theſe caſes, we ſhould give it in ſmall doſes, and truſt to length of time for a cure; and by this means we ſhall avoid thoſe inconveniencies of which phyſicians often complain in their preparations of iron.

"Mineral waters often produce cures which we in vain attempt to perform by the combinations in our ſhops, even although theſe waters contain nothing but iron. This is manifeſtly owing to the weakneſs of the doſe; in proof of which we find, that the ſtrongly impregnated waters ſeldom anſwer ſo well as thoſe weak ones we commonly reject."

This therefore is a ſtrong argument in favour of what I aſſerted in the former part of this chapter, with reſpect to the patience neceſſary for invalids, in order that fair trials might be made of the utility of the water in queſtion. They are not to go away diſſatisfied on account of their having derived no benefit in the ſpace of a week or a fortnight; but ſhould conſider, that where diſeaſes have continued for a length of time, the effects of habit are not ſo eaſily and ſpeedily removed.

Hitherto I have only mentioned the local diſeaſes of the ſtomach and inteſtines, in which this tonic is ſerviceable; it now remains for me to ſpeak of thoſe by which the whole conſtitution is affected. I have before ſaid, that in all caſes attended with inflammation, chalybeates are prohibited; but there ſeems to be an exception in one caſe, I mean that of an intermittent fever; and even here ſuch remedies are given in the intermediate days only; and under ſuch regulations I have no doubt but iron has been adminiſtered with advantage. I by no means here wiſh to be underſtood to ſay, that I would recommend patients labouring under tertian or quartan agues to watering-places, in order to drink a chalybeate; yet, ſhould they accidentally reſide in thoſe places, I ſhould be tempted to order them a trial.

In caſes of general debility, produced by fevers, and remaining long after the diſeaſe has ceaſed, I would recommend, in the moſt earneſt manner, the uſe of ſuch a water as that of Glouceſter; by which, if it at firſt be taken in ſmall quantities, and repeated twice a day together, with moderate exerciſe and free ſalubrious air, a conſtitution previouſly debilitated would in a ſhort time be firmly re-eſtabliſhed.

As nervous diſeaſes of all denominations generally ariſe from debility, which by producing irritability, is the cauſe of them, I would recommend the uſe of the chalybeate, which is now the object of our enquiry, to the attention of thoſe affected with ſuch diſorders.

Under nervous diſeaſes are to be conſidered paralytic affections of all kinds, after they have continued for ſome time. All caſes of tremor, depending on debility, which too often ariſe from the improper and free uſe of coffee, tea, tobacco, &c. all thoſe of languor, particularly when approaching to ſyncope or fainting, and likewiſe indigeſtion, attended with nauſea, ſickneſs, inflation, eructation, &c. Cloroſis, which is always a diſeaſe of the aſthenic kind, and conſequently attended with nervous ſymptoms, has been ranked by Dr. Cullen, in his Noſology, under the claſs of neuroſes, or nervous diſorders. This diſeaſe is generally attended with ſuch a conſiderable laxity and flacidity of the whole ſyſtem, that in no one caſe is the uſe of tonic remedies more fully indicated, or are the ſalutary effects of chalybeates more fully demonſtrated than in this diſeaſe: to ſuch, then, I have no doubt but the frequent uſe of this chalybeate may be of ſervice.

It may be here proper to ſay a few words with reſpect to the uſe of this water in other female complaints, which are not ranked in the ſame claſs of diſeaſes; particularly where the menſtrual flux may have been either retarded or immoderately encreaſed. In the former, when the patient is affected with ſluggiſhneſs, laſſitude and debility, with various ſymptoms of indigeſtion; when the face loſes its vivid colour, becomes pale and flaccid, and the breathing is hurried by quick and laborious motion of the body, and the heart is liable to palpitation, and ſyncope, or fainting, when attended with head-ache and pains of the back, there can be little doubt that ſuch a ſuppreſſion depends upon a general laxity and debility of the conſtitution, which thereby produces a weaker action of the veſſels of the uterus: in ſuch a caſe, the propriety of the uſe of the Glouceſter water is evident, becauſe, in addition to the chalybeate principle, there is joined a gaſeous ſpirit, poſſeſſing ſuch ſtimulating and invigorating powers, as may ſo reſtore the tone and ſenſibility of the veſſels, that ſuch an obſtruction may be expected ſoon to be removed.

We next come to treat of the oppoſite diſeaſe, namely, the immoderate flow of the menſes, which may proceed from too oppoſite cauſes, viz. that of too great an action of the veſſels of the uterus, depending upon inflammation, in which the uſe of chalybeates would be imprudent; or from too great a laxity of the exhalent veſſels, by which means ſuch an evacuation often takes place, as to debilitate the whole conſtitution at large: in ſuch caſes chalybeates and mineral waters may not only be uſed with ſafety, but great relief may be reaſonably expected.

There is one more diſeaſe to which females are liable I mean the fluor albus. This from all its various ſymptoms, and from its ariſing from almoſt the ſame cauſes, which produce an immoderate flow of the menſes, inclines me to ſuppoſe that a laxity of the extreme veſſels of the uterus is its proximate cauſe, which, in great meaſure, explains why it ſo often follows or attends the diſeaſe above mentioned. As the effects of this are ſo ſimilar to thoſe in the former, particularly the debility prevailing in the functions of the ſtomach, I have no doubt but the ſame method of cure is to be attempted, only with leſs reſerve with reſpect to the uſe of aſtringent and tonic remedies; hence, in ſuch a caſe, chalybeate waters may be uſed with leſs fear, and with greater proſpect of benefit.

Almoſt all the diſeaſes called ſpaſmodic, are to be enumerated in the catalogue of nervous*.

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* Under this title Dr. Cullen comprehends all the diſeaſes which conſiſt in motu abnormi; that is, in a præternatural ſtate

All theſe depend upon either ſome unnatural irritating cauſes, ſuch as external injuries, pain, dentition, worms, the exhibitions of poiſons, crudities in the ſtomach, &c. or, upon a certain ſtate of the nervous ſyſtem called irritability, by which it is præternaturally liable to be affected with the moſt gentle, ſimple, and common irritations, to which we are hourly expoſed; and ſuch as did not previouſly affect us when in a ſtate of health.

As thoſe diſeaſes, depending on external cauſes, are removed when ſuch cauſes have ceaſed, they are not conſidered as belonging to this claſs of diſeaſes; I ſhall therefore not make any comment upon them in this treatiſe. I ſhall mention thoſe only which ariſe from the irritability of the nervous ſyſtem, which becoming conſtitutional diſeaſes, more ſtrictly are to be called nervous. Theſe are convulſions, St. Vitus's dance, epilepſy; which latter, if it is not owing (as it is too often the caſe) to original conformation, but has been brought on in the courſe of life, and not been of too long a continuation, may admit of relief from tonic medicines. Much in my opinion may be

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ſtate of the contraction and motion of the muſcular or moving fibres in any part of the body. Vide vol. 3d. page 275.

done to prevent and obviate the ill effects of the diſeaſe, by a continued drinking of chalybeates.

The remaining ſpaſmodic diſeaſes are palpitations of the heart, aſthmas, pyroſis, or water-braſh, hyſteria, cholera, diarrhæa, and all bilious complaints when free from fever. With reſpect to the two latter diſeaſes, I by no means adviſe my readers to uſe ſuch waters while they are labouring under them; but am fully convinced they may be uſed, with the greateſt propriety, as ſoon as they are in ſome meaſure recovered; by which means a ſpeedy relapſe, which too commonly happens, may be prevented.

I come now to point out the remaining chronic diſeaſes in which chalybeate waters may be of ſervice, and in which I believe more real benefit is to be expected. Theſe are chiefly claſſed under the name of Cachexiæ *, ſuch as tabes, producing emaciations, hectic fevers, ephidroſis, or profuſe ſweatings, dropſies of all kinds, whether anaſarca, aſcites, or hydrotherax, ſcrophula, ſcorbutus, and jaundice.

Dropſies almoſt univerſally depend upon debility, too often brought on from improper modes

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* Derived from the Greek χαχος, malus, bad, and εξις, conſuetudo, habit.

of living; and is a diſeaſe to which the human frame is moſt ſubject. It may ariſe from two different phyſiological cauſes, viz. a laxity of the exhalent veſſels, by which ſo much water will be poured out into the different cavities of the animal frame, that the abſorbents may not be able to perform their office; hence the fluid will accumulate: or although theſe veſſels may not exhale too much, yet the abſorbents may be ſo far advanced in a ſtate of relaxation, that they cannot take up the ordinary quantity thus poured out; hence too cauſes may be conjoined; and as debility will produce theſe two effects, it becomes too generally an incurable cauſe of dropſy. Surely, then, in ſuch a diſeaſe, tonic remedies are to be uſed; and I know from my own experience, that where thoſe of the ſtrongeſt have failed, the adminiſtration of mineral waters, containing very ſmall quantities of iron, has often produced the moſt happy effects.

With reſpect to ſcrophula, or king's evil, I ſhall only make an obſervation or two. This diſeaſe ſeems particularly connected with debility; and experience ſhews us, that the more the conſtitution of children and others is invigorated, the malady in proportion decreaſes. This water, as a chalybeate, may be ſerviceable in this diſeaſe, by the power it poſſeſſes beſides, as a general ſtimulus, by which it may pervade the lymphatic ſyſtem, diſburden obſtructed glands in remote parts, encreaſe a ſecretion from the inteſtinal glands, and thereby diſcuſs glandular tumours in all parts of the ſyſtem. There is likewiſe reaſon to believe, that the external application of this water, when tepid, may be of ſervice in the healing of ſcrophulous ulcers.

Since the ingenious treatiſe upon ſcurvy and putrid fevers, publiſhed a few years ſince by Dr. Millman, wherein he has uſed ſuch ſtrong arguments to overthrow the opinion, that theſe diſeaſes depend upon any natural tendency of the fluids to putrefaction, and to prove that their cauſes ariſe from a deficiency in the moving powers; I have little doubt of the efficacy of chalybeates, not only towards curing, but alſo towards preventing ſuch inveterate diſeaſes, formerly too prevailing where a conſiderable number of people were confined together.

Having mentioned all the effects of iron as a chalybeate, the next thing that falls under my conſideration is fixed air; the effects of which, when introduced into the conſtitution by means of different preparations, are ſo well known, that there can be little room for me to enlarge on the ſubject. Its ſtimulant and antiſcorbutic qualities have been fully eſtabliſhed by Dr. Macbride and others: the former quality is diſcovered by its exhilerating, refreſhing, and even inebriating effects, which take place ſoon after drinking any water or liquor wherein this air is contained; of which I cannot give a more familiar inſtance, than in the uſe of ſpruce-beer, aerated cyder, perry, &c.

Dr. Aſh, in his Analyſis of the German Waters, obſerves, that during his reſidence at Spa, the laborious peaſantry of that country indiſcriminately made uſe of theſe waters from the fountain that was neareſt the place of their labour, in order to ſupport themſelves under the fatigues of their work, while expoſed to the heat of the ſun, in the ſame manner as the labourers in other countries have recourſe to liquors produced by fermentation.

That ſuch exhilerating effects do take place from the uſe of this water, I can ſafely, from experience, take upon myſelf to aſſert as a fact; for although I did not drink it regularly every day, yet I always obſerved, that whenever I had made uſe of it, my ſpirits were more elated, and I was enabled to purſue my experimental enquiries with great pleaſure and eaſe to myſelf.

The effects of this air as a ſtimulant, are by no means local, but are extended over the ſyſtem at large; an hilarity of mind, together with an agreeable alacrity, mobility, and vigour of the body, is produced from the uſe of it. From the above qualities of this aeral acid, it may with propriety be uſed, with a view of renewing and exciting a loſs of ſuch powers in the muſcular ſyſtem, as have been previouſly enfeebled; hence, in the caſe of paralyſis, and other nervous affections, depending upon immobility, or want of a power in certain muſcles, this water may with reaſon be adminiſtered: Sorry am I only to add, that ſuch diſeaſes too often ariſe from permanent and irremoveable cauſes.

When rheumatiſm has remained in the conſtitution a length of time, and, from the ſymptoms attending it, there appears no inflammation, it has been properly called chronic rheumatiſm. The diſeaſe, in this ſtage, evidently depends upon atony, both of the blood veſſels and of the muſcular fibres of the part affected, together with a degree of rigidity, and contraction in the latter, ſuch as frequently attend them in a ſtate of atony: From this view, the general indication of cure muſt be to reſtore the activity and vigour of the vital principle in the part * ; and there is reaſon to aſſert, that chalybeates and ſtimulants will be of ſervice in this diſeaſe.

By ſo general and univerſal a ſtimulus as fixed air, all the ſecretions and excretions are kept in a proper balance, provided not improperly uſed, by which means the perſpiration is conſtantly preſerved. There is reaſon, therefore, to ſuppoſe, that in caſes of leproſy, and other obſtinate cutaneous diſorders, if this water is uſed in a regular manner, it may not only often give conſiderable relief, but eradicate the diſeaſe.

I come now to ſpeak of the antiſeptic qualities of fixed air. Although this air, when taken copiouſly into the lungs by means of inſpiration, proves to be a moſt immediate and powerful poiſon; yet, when received into the ſtomach and inteſtines, great benefit has been received. This air has been conſidered by Dr. Hales, as the principle which cements the ſolid particles of animal bodies together; and Dr. Macbride en-

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* Vide Dr. Cullen's Firſt Lines of the Practice of Phyſic, p. 34. vol. 2d.

deavours further to ſhew, that without the extrication of this air, no putrefaction can happen; and that even by the abſorption of it, putrefied ſubſtances may be corrected and rendered ſweet. Having expoſed putrid matters to the vapours ariſing from fermenting mixtures which generated this acid, he found the putrid quality was deſtroyed; and hence he conſiders this air as a powerful antiſeptic. Fixed air, when received into the body, has always been ranked as the firſt antiſeptic, in caſes of violent ſcurvy and putrid diſeaſes; and when it enters into the combination of water, or other liquors, it not only has an antiſeptic power, but acts alſo as a ſtrengthening and corroborating medicine.

That great benefit has been received by people labouring under violent ſcorbutic affections, appears evident from the beneficial effects of ſpruce beer, when taken freely upon long voyages; of which we have many inſtances related by Captain Cook, and others.

Various have been the means of exhibiting this valuable medicine internally. One of the beſt methods made uſe of in this country, is that by means of Mr. Nooth's apparatus for making artificial mineral waters, which is now ſo well underſtood as to require from me no explanation.

From theſe and other circumſtances we have reaſon to believe, that thoſe waters, in which this mineral ſpirit forms a conſtituent part, contribute very much to encreaſe the tone and vigour of the conſtitution; and there can be no doubt but the corroborating effects are greatly encreaſed, when united with that excellent chalybeate before mentioned.

I come next to ſpeak of the abſorbent earths, chalk and magneſia, which are contained in the Glouceſter water. Theſe have always been conſidered as correctors of acidity, whenever they meet with it either in the ſtomach or inteſtines, and thereby become uſeful medicines wherever there are crudities, which ariſe from indigeſtion, thereby producing eructation, flatulence, heartburn, and the like. Magneſia, beſides its abſorbent quality, proves a gentle laxative; and therefore, after having corrected acidities and vitiated bile in the firſt paſſages, it will tend to promote their expulſion.

From the ſmall quantity of Epſom ſalt contained in this water, I doubt whether any benefit can be expected from it as a purgative. I have been informed by ſome who uſed it frequently, that ſuch effect has often taken place: it is ſaid by ſome, that the purgative quality of ſalts is greatly heightened by dilution; and that a quarter of an ounce, contained in the Cheltenham water, operates more briſkly, than a whole ounce of common glauber ſalts, when diſſolved only in two ounces of common water. This circumſtance may not appear ſo ſtrange, if we reaſon from analogy, which teaches us every day, that the effects of medicines are not always in proportion to the quantity, but often varies according to the difference of the formula in which they are preſcribed.

I have now mentioned nearly all the diſeaſes in which this chalybeate water may be ſerviceable; each of which appear to originate from a want of vigour and mobility in the nervous and muſcular ſyſtem. From the medicinal qualities which it poſſeſſes, there is every reaſon to ſuppoſe, that great benefit may be received in all thoſe diſeaſes upon which I have treated; and when we conſider that ſome of them may ariſe from mechanical cauſes, far beyond the reach of medicine, we are not to attribute the want of ſucceſs to the inefficacy of the water.

Since my return from Glouceſter, and even ſince ſome of theſe pages have been committed to the preſs, I have been favoured with the following letter from the Honourable Mr. F. B. which cannot be introduced more properly than at the end of this chapter.

"SIR,

"I ſhould really conſider myſelf deficient in gratitude, were I to omit informing you, that hardly a week paſſes that does not convince the public, more and more, of the juſtice of your judgment relative to the Spa water here. No one can with greater juſtice and propriety than myſelf ſpeak to it.

About a month ago I arrived here, and immediately began to drink the water three times a-day, which has actually cured me of a dreadful ſcorbutic complaint, which for years paſt had baffled every attempt of the faculty to cure. I was alſo ſubject to a rheumatic and nervous complaint, the former almoſt gone. I had for ſeveral months continued the uſe of the water of a celebrated Engliſh Spa, without effect (indeed I had it brought to my lodgings); in ſhort, I am greatly mended in my health, in every reſpect, within this month paſt. I am, Sir,

Your moſt obliged humble ſervant,

Glouceſter,
June 15, 1789. F. B.

DOCTOR HEMMING.

CHAP. IV.

UPON this ſubject I believe very little is neceſſary to be ſaid. What I have to offer, I ſhall arrange under the following heads:

1ſt. The regimen, which reſpects exerciſe, diet, and ſleep.

2dly. The preparation to be obſerved previous to drinking the water.

3dly. The quantity of water neceſſary to be taken at each time.

From the obſervations I have formerly made upon the uſe and abuſe of mineral waters, which are by no means confined to them alone, but are equally applicable to any medicines; whether bark, chalybeates, mercury, or others, it becomes neceſſary for every one who expects relief from either, to ſubmit to a regular attendance; he muſt therefore arm himſelf with a ſtock of patience and perſeverance; and to theſe he muſt join temperance of every kind.

REGIMEN.

Exerciſe.—Exerciſe is conducive to health in all places, and at all times; I would therefore adviſe thoſe who frequent mineral waters, to riſe early in the morning, becauſe they may then take it with greater eaſe, and be leſs incommoded than in the heat of the day.

The exerciſe of riding, or walking, greatly facilitates the operation of all ſuch waters; but it ſhould not be protracted beyond the ſtrength of the patient; it promotes their efficacy, by preventing their paſſing too quickly by urine; and if a gentle perſpiration, which does not amount to a ſweat, can be produced, it promiſes benefit. I would likewiſe remark, that exerciſe ſhould ever be uſed between the draughts of the water; and that of walking briſkly is be recommended.

Diet.—As moſt of the diſeaſes to which this water is applicable depend upon debility, a generous diet, together with a moderate uſe of the juice of the grape, ought to be recommended: there may, however, be certain diſeaſes in which ſuch general advice would be improper. Animal food can hardly ever be injurious, provided it is prepared in the moſt ſimple manner; I mean, where the ſavour is not heightened by the addition of made gravies; and in all caſes, plain roaſt or boiled meat, whether butcher's meat, or poultry, is far preferable to made diſhes. This kind of food ſhould only be taken once a day, and that at dinner. Broths of all kinds may be of ſervice, provided they do not approach to the nature of *rich* ſoups. Theſe, however, in the hot months of ſummer, would much better be entirely omitted.

Although there is an acid preſent in this water, yet it by no means operates as an objection to the invalids uſing milk, while drinking it. Dr. Aſh, in his analyſis of the German waters, which contain a much larger quantity of fixed air than the Glouceſter, obſerves that there is not a ſingle inſtance where milk ever diſagreed with any perſon from the bare uſe of the Spa water at the ſame time; and therefore ſays, that whenever a milk diet is proper, that will be no objection to the uſe of Spa water at the ſame time.

The drinking tea twice a day is certainly improper, as it ſeems fitted to anſwer a different indication than a chalybeate water, and of courſe renders the virtues of it leſs effectual. Cocoa, or chocolate, with milk for breakfaſt, is in general preferable to tea or coffee.

Sleep.—When I recommended exerciſe, I mentioned the neceſſity of uſing it at an early hour; in order to put this in practice, the neceſſity of going to bed by eleven at furtheſt, appears evident. A proper quantity of ſleep is neceſſary, not only for the preſerving of health, but is more particularly demanded for invalids, debilitated by diſeaſe; by aſſiſting the organs of digeſtion, it contributes to the nouriſhment of the body; for it is obſerved by all phyſiologiſts, that although they operate more ſlowly during ſleep, than in the hours of watchfulneſs, yet their functions are performed in a more perfect and regular manner. Surely then the neceſſity of ſleep for invalids frequenting a mineral water, does not require further recommendation.

The paſſions of the mind ſhould likewiſe be attended to; they ſhould be kept within bounds; every exceſs exaſperates the diſtemper, hinders digeſtion, and conſequently debilitates. All ſuch purſuits as relax the conſtitution, and render the nervous ſyſtem too exquiſitely ſenſible, are to be avoided.

PREPARATION NECESSARY.

Few preparations are neceſſary to the drinking this water; but its virtues may be aſſiſted and encreaſed by the adminiſtration of a medicine or two previous to uſing it. As the purgative quality of this water is ſo trifling, it may be neceſſary to cleanſe the firſt paſſages by a gentle cathartic; this may be repeated every week or fortnight afterwards, according to various circumſtances; for it has been obſerved, that when this has firſt been neglected, mineral waters have oftentimes diſagreed, but afterwards they have agreed very well.*

Dr. Sutherland, in his analyſis of the Briſtol waters, obſerves that bleeding may be a neceſſary preparative for thoſe who ſport with the waters, or drink them becauſe they would not be out of the faſhion: but as in moſt diſorders for which they are proper, bracing and ſtrengthening ſeem to be indicated, this evacuation not only ſeems uſeleſs, but appears pregnant with danger. What is applicable to the Briſtol, is equally ſo to the Glouceſter mineral water. I would not recommend this evacuation as preparatory. If, however, any inflammatory fixed pains, giddineſs, or plethora, ſhould be brought on by the uſe of it, a ſmall evacuation by bleeding may be neceſſary.

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* Dr. Rutty on Mineral Waters, page 333.

SEASON FOR DRINKING IT.

As this water is, undoubtedly, much better, on account of its greater ſtrength, in a ſerene and dry ſtate of the air, than when the weather has been rainy and cloudy for a length of time, the ſummer ſeaſon is beſt calculated for its uſe; to which we may join the greater convenience of taking exerciſe. In general, it may be uſed from the month of April to the end of October. It, however, may be drank in the very middle of winter, provided it is uſed during the time of a froſt, as, at ſuch a period, I believe its acid may be much ſtronger, and thereby the water may be more impregnated with its ſolid contents; if, however, it ſhould be uſed in ſuch a ſeaſon, the neceſſity of exerciſe afterwards becomes more urgent.

Quantity.—I am now come to my laſt diviſion, upon which I cannot offer any thing that can be very uſeful to my readers. The quantity proper for one, may by no means be adapted for others: I think, however, it may be a neceſſary caution to adviſe them not to uſe it too freely at firſt. The idea of drinking large quantities is very erroneous, for by the means this water may paſs off ſo quickly, either by the bowels, or by urine, that very little advantage to the conſtitution at large can be derived.

I ſhould think it adviſable to begin with drinking a quarter of a pint in the morning before breakfaſt, provided there is an hour allowed for exerciſe after its uſe. This is an additional reaſon for the neceſſity of early riſing. If, after a trial for four or five days, it has not had any improper effect, I would recommend the doſe to be encreaſed to half a pint, and more. During the hot weather, it would be imprudent to drink of it in the middle of the day, though in the winter this time would be moſt adviſable. When the heat of the day is decreaſed, a ſecond glaſs would be uſeful, provided there is a ſufficient time between the taking of it, and the hour of ſupper, for exerciſe, whether that of riding or walking.

I have now completed the different heads of my treatiſe, according to the arrangement mentioned in my firſt chapter. I have only to lament the very inelegant and inaccurate manner in which this treatiſe appears, owing to the advanced period of the ſeaſon, which demanded the immediate publication. If, however, indigeſted as it may appear, it ſhould anſwer the purpoſe intended, viz. the eſtabliſhing of the utility of the mineral ſpring, which has been the object of my conſideration, *my wiſhes* are accompliſhed, a conſiderable advantage will accrue to the city of Glouceſter, and the great and expenſive undertakings of Mr. Lewis, the proprietor, will be crowned with ſucceſs.

FINIS.

At the particular Requeſt of Mr. Lewis, *the Proprietor of the Glouceſter Water, I inſert the following Caſes.*

CASE I.

I BETTY GARLICK, in the pariſh of Elſtone, near Birdlip, in the county of Glouceſter, was for ſeveral years afflicted with a leproſy. The faculty gave me little hopes of recovery; but, by hearing of the Glouceſter Spa Water, I procured ſome bottles of it, which I drank, and in about eight weeks the ſkin of my fleſh became ſleek and ſmooth, and am now actually cured of this grievous diſeaſe. In witneſs hereof I ſign my name to the above cure.

The mark of ⋉ BETTY GARLICK.

James Bennet, Overſeer,
Wm. Gordon, Churchwarden.
Dec. 31ſt, 1788.

CASE II.

ELIZABETH MORGAN, Berkeley-Street, Glouceſter.—I was violently attacked with the rheumatiſm, and was an out-patient in the hoſpital, but found no relief. I was ſo exceedingly bad that I was confined to my bed for ſixteen weeks; by a conſtant application to the Glouceſter water for two months, I was perfectly relieved of the excruciating pains; the truth of which I certify by ſettting to my hand.

The mark of ⋉ ELIZABETH MORGAN.

CASE III.

JANE HARRIS, of Upton, St. Leonard's.—I was grievouſly afflicted with a dreadful diſorder called the king's evil; ſo bad, that I was incapable of helping myſelf, and was upwards of twelve months in Glouceſter Infirmary, and came out incurable, without any relief.—My death was expected.—I was adviſed the Glouceſter Water, which I drank for ſome time, and waſhed my wounds therewith; and I am now in a fair way of recovery.

Certified by PETER SNELL, Eſq.

WM. ABELL, Churchwarden.

CASE IV.

Glouceſter County Gaol,

SIR, January 3d, 1789.

AS my affairs are happily ſettled, and I am about to leave Glouceſter, I beg leave to return you my beſt thanks for the uſe of your Spa Water, which I have gratuitouſly partaken of during my impriſonment. My caſe was ſcorbutic, attended with extreme dejection of ſpirits, loſs of appetite, and painful wearineſs in my limbs: by the uſe of the water for about three months, I am perfectly relieved in all theſe reſpects; and for the ſake of others who may labour under the ſame affliction, you are at liberty to make what uſe you pleaſe of this my declaration.

I am your grateful
and obedient ſervant,

Witneſs W. JARVIS.

OLIVER ALKEN.

To Mr. LEWIS, at the Spa,
in Glouceſter.

⁂ There are many other Caſes which might be inſerted, all of which may be ſeen by applying to Mr. Lewis.